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मानक

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Mazdoor Kisan Shakti Sangathan

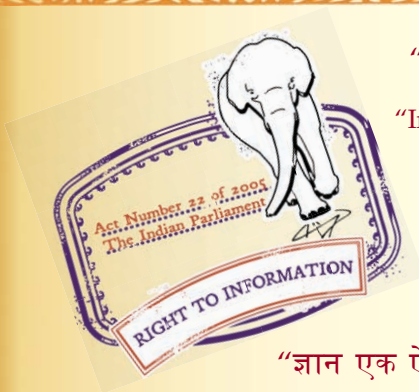
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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8872-2-5 (1980): Variable Resistors, Part 2: General Purpose, Section 5: Type VRG 5C [LITD 5: Semiconductor and Other Electronic Components and Devices]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

(Reaffirmed 2002)

SPECIFICATION FOR VARIABLE RESISTORS

PART II GENERAL PURPOSE

Section 5 Type VRG 5C

0. General—This standard shall be read in conjunction with IS: 8872 (Part I)-1977 'Specification for variable resistors: Part I General requirements and methods of tests'.

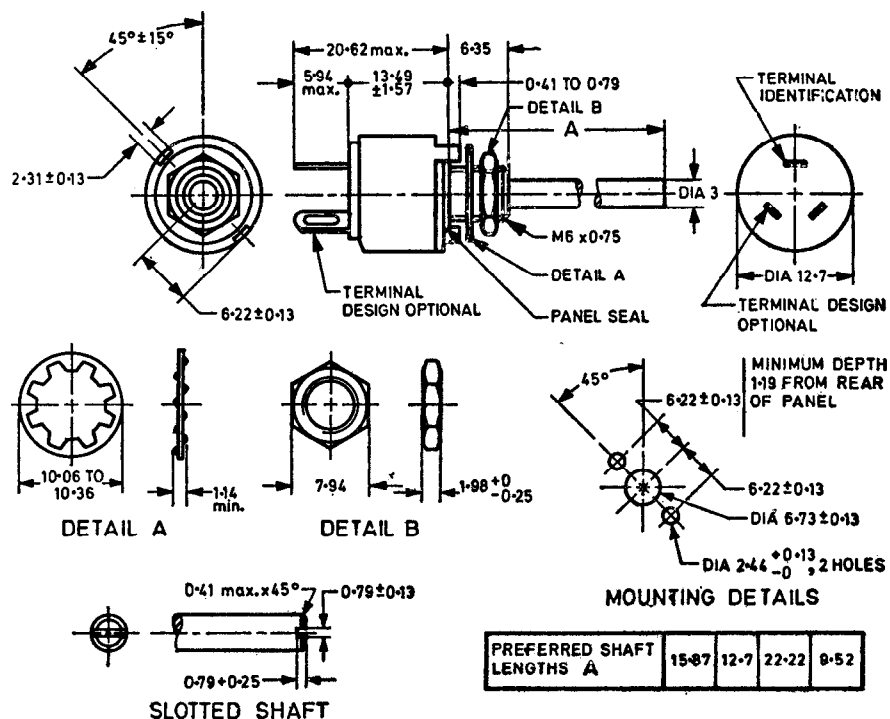
1. Outline Drawing and Dimensions—The outline drawing and dimensions shall be according to Figures 1 and 2.

2. Ratings—Ratings shall be as specified in Table 1.

Note — For ratings at temperatures other than 125°C, reference shall be made to the derating curve shown in 4.

3. Characteristics

- | | |
|---|--------------------------------------|
| a) Climatic category | 65/175/56 |
| b) Low air pressure | 4·4 kPa |
| c) Acceleration | 170 m/s ³ |
| d) Bump | 4 000 bumps |
| e) Vibrations | 10 to 2 000 Hz, 200 m/s ² |
| f) Shock | 500 m/s ² |
| g) Resistance range | See Table 1 |
| h) Selection tolerance | ±10 percent |
| j) Rated dissipation at 125°C | See Table 1 |
| k) Temperature characteristic of resistance | ±250 ppm/°C |
| m) Stability after endurance (electrical) | ±3 percent |
| n) Maximum surface temperature | 175°C |
| p) Typical construction | Cermet, non-wirewound |



Note 1 — All dimensions are in mm.

Note 2 — Unless otherwise specified, tolerance is ± 0.41

Note 3—Each resistor shall be supplied with a corrosion resistant internal tooth lock washer and a hexagonal nut.

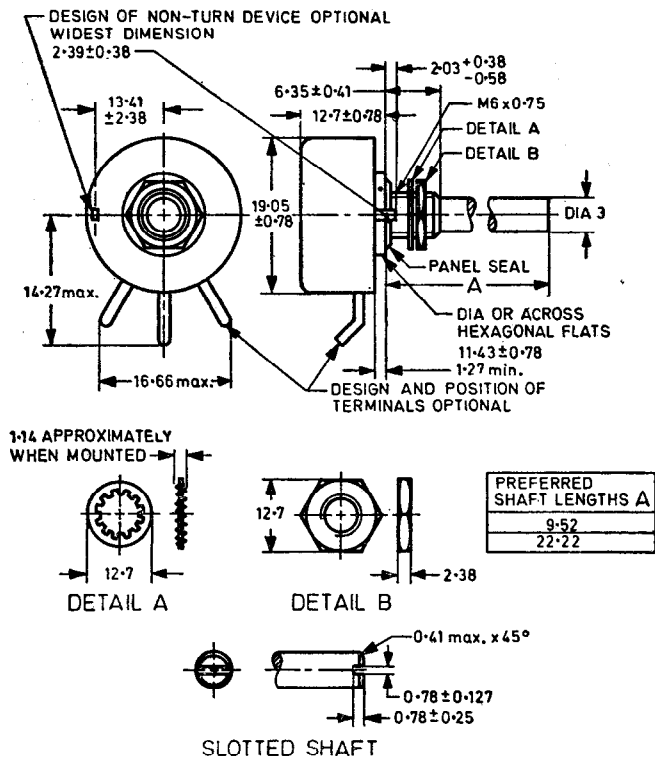
FIG. 1 OUTLINE DRAWING AND DIMENSIONS (Styles VRG5C-0.25 and VRG5C-0.5)

Adopted 7 July 1980

© March 1981, ISI

Price Rs **8.00**

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002



Note 1 — All dimensions are in mm.

Note 2 — Each resistor shall be supplied with corrosion resistant internal tooth lock washer and a hexagonal nut.

Preferred Shaft Length A
9.52
22.22

FIG. 2 OUTLINE DRAWING AND DIMENSIONS (Styles VRG5C-0.5 and VRG5C-1)

TABLE 1 RATINGS

(Clause 2)

Style Reference	Rated Dissipa- tion(W) at 125°C	Figure Refer- ence	Resis- tance Law	Operating Torque gm-cm	End Stop Torque Nm(Min)	End Thrust	Side Thrust	Resis- tance Range
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VRG5C-0.25	0.25	1	Log (Law B)	36.00-432.00	0.343	10	6.66	1 k Ω to 1 M Ω
VRG5C-0.5	0.5	1	Linear (Law A)	36.00-432.00	0.343	10	6.66	100 Ω to 2.5 M Ω
VRG5C-0.5	0.5	2	Log (Law B)	36.00-432.00	0.625	10	6.66	1 k Ω to 1 M Ω
VRG5C-1	1	2	Linear (Law A)	36.00-432.00	0.625	10	6.66	50 Ω to 5 M Ω

4. Derating Curve — See Fig. 3.

5. Marking — See 6 of IS: 8872 (Part I)-1977.

6. Material, Construction and Workmanship — See 5 of IS: 8872 (Part I)-1977.

7. Tests

7.1 Classification of Tests

7.1.1 Type Tests — The sequence of type tests and requirements shall be in accordance with Table 3.

7.1.1.1 Number of samples — The manufacturer shall submit 48 samples in each style for which the approval is required, having the numbers and values as follows:

- 16 samples of the highest value, including 2 spares,
- 16 samples of the lowest value, including 2 spares, and

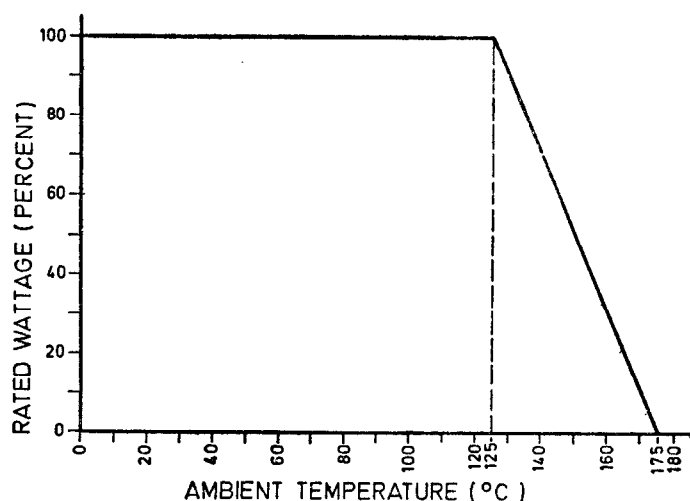


FIG. 3 DERATING CURVE

c) 16 samples of the middle value, including 2 spares.

Note—Where approval is sought for spindle lengths 15.87, 12.7 and 9.52 mm, apart from the samples submitted for approval with spindle length 22.22 mm, 2 samples each of the lowest, highest and middle values with the above spindle lengths shall be submitted as intermediate style for mechanical tests of third group namely:

- a) End Thrust,
- b) Side Thrust, and
- c) Endurance (Mechanical).

7.1.2 Routine Tests—The following shall constitute the routine tests and shall be carried out on each and every resistor :

- a) Visual examination,
- b) Continuity,
- c) Element resistance, and
- d) Sealing.

7.1.3 Acceptance Tests—For the purpose of the acceptance of the lot, all the samples shall be subjected to the tests as given in 7.1.2. Following this, two groups of samples (Group A and B) shall be drawn and the resistors in each group shall be subjected to the tests as specified in the Table 2.

TABLE 2 ACCEPTANCE TESTS

(Clauses 2 and 7.1.3)

SI No.	Test	AQL (Percent Defective)	Inspection Level	D/ND
(1)	(2)	(3)	(4)	(5)
1. Group A	Dimensions Resistance Law Voltage proof (two seconds) Operating torque Contact resistance variation	1	II	ND
2. Group B				
Sub-group B1	Solderability	4	S3	D
Sub-group B2	Resistance to soldering heat Robustness of terminations Endurance (mechanical) End stop torque	4	S3	D
Sub-group B3	Vibration climatic Climatic	4	S3	D
Sub-group B4	Electrical Endurance (168 hours)	4	S3	ND

D = Destructive
ND = Non-destructive

TABLE 3 TEST SCHEDULE AND REQUIREMENTS
(Clause 7.1.1)

SI No.	Test	Clause Ref IS : 8872 (Part I) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
i) <i>O Group</i> (48 samples)				
a)	Visual examination	9.1	—	The condition, workmanship and finish shall be satisfactory. Marking shall be legible and indelible
b)	Dimensions	9.1.1	—	Dimensions shall be as according to Figures 1 and 2
c)	Continuity	8.1	—	The change in resistance or voltage shall be smooth, continuous and unidirectional throughout the actual effective electrical travel
d)	Element resistance	8.2	—	Within the selection tolerance ± 10 percent
e)	Minimum terminal resistance	8.3	—	The minimum terminal resistance at either end of the resistor shall not exceed the values specified in Appendix A
f)	Minimum effective resistance and angle of ineffective rotation	8.5	—	The resistance value at angular positions are recorded for information only
g)	Angle of ineffective rotation (from termination 'a')	8.5.1	This is the angle between the two positions recorded above	—
h)	Value of minimum effective resistance (from termination 'a')	8.5.1	This is the resistance value as measured above	—
j)	Effective resistance and angle of effective rotation	8.6	—	The angle of effective rotation shall be between 292° and 298° for VRG5C-1 and VRG5C-2. Between 275° and 285° for VRG5C-3 and VRG5C-4
k)	Resistance law	8.7	—	The resistance value shall fall within ± 10 percent
m)	Voltage proof	8.9	750 V rms for 1 minute	No breakdown or flashover
n)	Operating torque	9.2	The value shall be as given in Table 1	—
p)	End stop torque	9.4	The value shall be as given in Table 1	There shall be no deformation or mechanical damage
q)	Sealing	11.5	—	The rate of leakage shall not exceed 1 cm ³ per hour
r)	Contact resistance variation	8.12.4	Number of cycles 6	The contact resistance variation shall not exceed 3 percent of the total resistance
ii) <i>First Group</i> (12 samples)				
a)	Solderability	9.8.3	—	As in IS : 8872 (Part I)-1977
b)	Robustness of terminations	9.7	—	As in IS : 8872 (Part I)-1977
c)	Bump*	9.10	4 000 bumps	—
1)	Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage

*Throughout the test, the resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS—Contd

SI No.	Test	Clause Ref IS : 8872 (Part I) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	2) Resistance	8.3	<i>Spindle Setting</i> — 40 and 60 percent of actual effective electrical travel. Styles with locking devices shall be locked with specified torque	The change in resistance from the initial value shall not exceed ± 6 percent
	3) Continuity	8.1	—	As in SI No. (i) (c)
	4) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 2 percent
d) Vibration*		9.9	10 to 2 000 Hz, 200 m/s ²	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage
	2) Resistance	8.3	<i>Spindle Setting</i> — 40 and 60 percent of actual effective electrical travel. Styles with locking devices shall be locked with specified torque	The change in resistance from the initial value shall not exceed ± 6 percent
	3) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 2 percent
	4) Continuity	8.1	—	As in SI No. (i) (c)
e) Shock*		9.11	500 m/s ²	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage
	2) Resistance	8.3	<i>Spindle Setting</i> — 40 and 60 percent of actual effective travel. Styles with locking devices shall be locked with specified torque	The change in resistance from the initial value shall not exceed ± 6 percent
	3) Continuity	8.1	—	As in SI No. (i) (c)
	4) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 2 percent
f) Acceleration*		9.12	170 m/s ²	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage
	2) Resistance	8.3	<i>Spindle Setting</i> — 40 and 60 percent of actual effective electrical travel. Styles with locking devices shall be locked with specified torque	The change in resistance from the initial value shall not exceed ± 6 percent
	3) Continuity	8.1	—	As in SI No. (i) (c)
	4) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 2 percent

*Throughout the test, the resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS—Contd

SI No.	Test	Clause Ref IS : 8872 (Part I) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
g)	Rapid change of temperature	10.5	65/175	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage
	2) Continuity	8.1	—	As in SI No. (i) (c)
	3) Element Resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 1 percent
h)	Climatic tests	10	—	—
	1) Dry heat	10.1.2	At $+175^{\circ}\text{C}$	—
	2) Damp heat (accelerated)	10.1.3	One cycle	—
	3) Cold test	10.1.4	At -65°C	—
	i) Operating torque	9.2	—	The value shall not exceed three times the maximum value specified in SI No. (i) (n)
	4) Low air pressure	10.1.5	8.5 kPa During the last 5 minutes of the test the samples shall be loaded for 50 percent of the rated dissipation subject to the low air pressure voltage limitation	—
	5) Damp heat (accelerated) remaining cycles	10.1.6	—	—
	i) Visual examination	9.1	—	There shall be no corrosion, fracture, loosening of parts or other mechanical damage. Marking shall remain legible and indelible
	ii) Continuity	8.1	—	As in SI No. (i) (c)
	iii) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 5 percent
	iv) Insulation resistance	8.10	—	The value shall not be less than 100 M Ω
	v) Operating torque	9.2	—	As in SI No. (i) (n)
	vi) Voltage proof	8.9	—	No breakdown or flashover
iii)	Second Group (6 samples)			
a)	Damp heat (long term)	10.2	—	—
	1) Visual examination	9.1	—	There shall be no corrosion, fracture, loosening of parts or other mechanical damage. The marking shall be legible and indelible
	2) Continuity	8.1	—	As in SI No. (i) (c)
	3) Element resistance	8.2	—	The change in resistance from the initial value shall be within ± 5 percent
	4) Insulation resistance	8.10	—	The value shall not be less than 100 M Ω
	5) Contact resistance variation	8.12.4	—	As in SI No. i (r)
	6) Operating torque	9.2	—	As in SI No. (i) (n)

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS—Contd

SI No.	Test	Clause Ref IS : 8872 (Part I) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	7) Voltage proof	8.9	—	No breakdown or flashover
	8) Solderability	9.8.3	—	As in SI No. (ii) (a)
iv) <i>Third Group</i> (6 samples)				
a)	End thrust	9.6	—	The value of resistance measured shall be recorded
	1) Resistance	8.3	—	The change in resistance from the value measured in SI No. iv (a) shall not exceed 1 percent
b)	Side thrust	9.6	—	The value of resistance shall be measured
	1) Resistance	8.3	—	The change in resistance from the value measured in SI No. iv (b) shall not exceed 1 percent
c)	Endurance (mechanical)	11.3	50 000 cycles not less than 4 000 cycles per day	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage
	2) Continuity	8.1	—	As in SI No. (i) (c)
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 5 percent
	4) Contact resistance variation	8.12.4	—	As in SI No. (i) (r)
	5) Sealing	11.5	—	The rate of leakage of air shall not exceed 1 cm ³ per hour
v) <i>Fourth Group</i> (6 samples)				
a)	Endurance (electrical)	11.4	At +125°C	—
	1) Visual examination	9.1	—	There shall be no fracture or any other mechanical damage. Marking shall be legible and indelible
	2) Continuity	8.1	—	As in SI No. (i) (c)
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 4 percent
	4) Minimum terminal resistance	8.3	—	As in SI No. (i) (c)
	5) Insulation resistance	8.10	—	The value shall not be less than 100 M Ω
	6) Voltage proof	8.9	—	No breakdown or flashover
	7) Sealing	11.5	—	The rate of leakage shall not exceed 1 cm ³ per hour
	b) Flammability	11.2	—	—
vi) <i>Fifth Group</i> (3 samples)				
a)	Mould growth	10.4	—	As in IS : 8872 (Part I)-1977
vii) <i>Sixth Group</i> (3 samples)				
a)	Resistance to soldering heat	9.8.4	—	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical deterioration

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS—Contd

SI No.	Test	Clause Ref IS : 8872 (Part I) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	2) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 1 percent
viii) <i>Seventh Group</i> (6 samples)				
a)	Temperature characteristic of resistance	8.11	The temperature condition(s) shall be 125°C	The value shall be ± 250 ppm/°C
b)	Salt mist	10.3	—	—
	1) Visual examination	9.1	—	There shall be no corrosion, loosening of parts or other mechanical deterioration. The marking shall be legible and indelible
	2) Continuity	8.1	—	As in SI No. (i) (c)
	3) Element resistance	8.2	—	As in SI No. (i) (d)
	4) Insulation resistance	8.10	—	The values shall be not less than 100 M Ω
	5) Operating torque	9.2	—	As in SI No. (i) (n)
ix) <i>Spares</i> (6 samples)				

APPENDIX A

[Table 3, SI No. i(e)]

MINIMUM TERMINAL RESISTANCE

Style and Law	Total Resistance	Maximum Value of Minimum Resistance	
(1)	(2)	(3)	
VRG5C-2 and VRG5C-4 Law 'A'	100 Ω to 750 Ω inclusive	2 Ω	
	1K Ω to 10K Ω	5 Ω	
	15K Ω to 50K Ω	10 Ω	
	75K Ω to 0.1M Ω	15 Ω	
	0.15M Ω to 0.25M Ω inclusive	20 Ω	
	0.35M Ω to 0.5M Ω	25 Ω	
	0.75M Ω to 1M Ω	50 Ω	
	1.5M Ω to 2.5M Ω	75 Ω	
VRG5C-1 and VRG5C-3 Law 'B'		<i>Clockwise</i> (Terminations c & b)	<i>Counter Clockwise</i> (Terminations a & b)
	100 Ω to 750 Ω inclusive	5	2
	1K Ω to 5K Ω	10	5
	7.5K Ω to 10K Ω	20	10
	15K Ω to 25K Ω	50	15
	25K Ω to 50K Ω	75	20
	75K Ω to 100K Ω	100	25
	100K Ω to 1M Ω	200	50